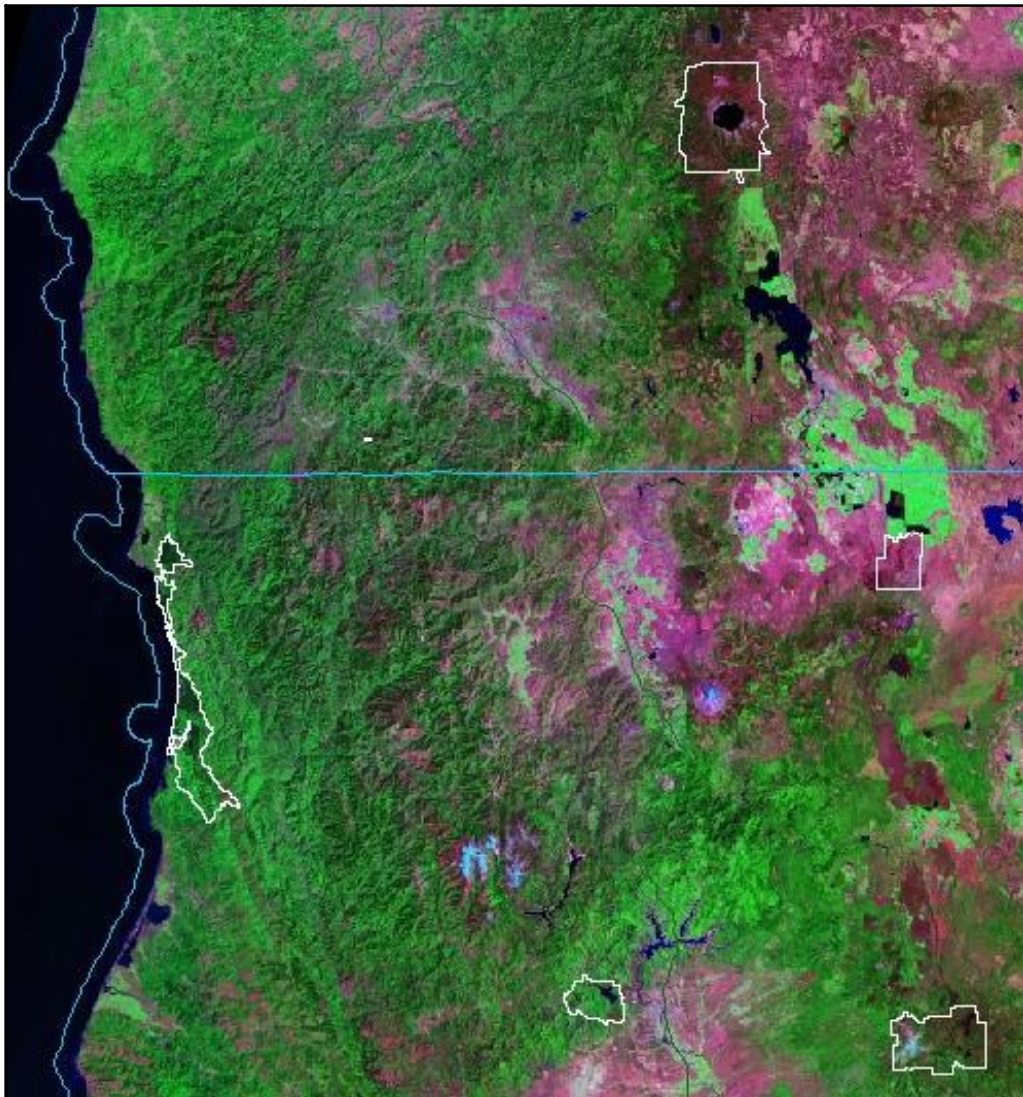




Klamath Network Data Mining Phase I Protocols

KBaM!

Natural Resource Report NPS/PWR/KLMN/NRR—2007/001



ON THE COVER

Digital Landsat image of Klamath Network. Network park boundaries shown in white.
Image courtesy Klamath Network.

Klamath Network Data Mining Protocol

KBaM!

Natural Resource Report NPS/PWR/KLMN/NRR—2006/XXX

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NPS D-XXX, June 2005

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1.0 Introduction

The National Park Service (NPS) has embarked upon a long term, far reaching task with the implementation of the Inventory and Monitoring (I&M) Program. This program is the culmination of a number of studies and recommendations that have charged the Park Service with doing a better job of bringing natural resource management into the twentieth century by establishing resource management decisions on strong scientific based information. To accomplish this, the resource managers and staff need information structured and available in standard digital formats, easily accessed, interpretable, and comprehensive. When information is structured and available in this manner, researchers may adapt their future needs based upon what has been done without unnecessarily repeating or reproducing the same information. Just as a graduate student commences their research by first finding what has already been done and what is available on their research topic, so do resource managers need the same information available to them in order to move forward. Data mining is an attempt at getting that past information, currently stored in dusty file cabinets, back room bookshelves, and attic boxes, cataloged and digitized.

We, in the National Park Service (NPS), have been charged with the trust of preserving our cherished natural resources since our creation in 1916. For most of the 20th century, we have practiced a curious combination of active management and passive acceptance of natural systems and processes, while becoming a superb visitor services agency. In the 21st century that management style clearly will be insufficient to save our natural resources. Parks are becoming increasingly crowded remnants of primitive America in a fragmented landscape, threatened by invasions of nonnative species, pollution from near and far, and incompatible uses of resources in and around parks.

Protection of these natural resources now requires active and informed management to a degree unimaginable in 1916. The lack of information about park plants, animals, ecosystems, and their interrelationships is profound. If we are to protect these resources into the far future, we must know more. ([Natural Resource Challenge, 1999](#))

On August 12, 1999, Robert G. Stanton stood before a crowd at the centennial celebration of Mt. Rainier National Park and announced the Natural Resource Challenge (NRC). In [Robert G. Stanton's speech](#), he stressed the NPS's commitment to preserving its parks for future generations. The NPS I&M program, conceived in 1992, benefited from the NRC and received funding to implement strategies designed to preserve natural resources. The I&M program responded by creating NPS databases, among other things, aimed at cataloging our scientific knowledge in order to make the information easily accessible and comprehensive. Managers will have easy access to information about their parks with a mouse click! Data mining is about finding information to populate these databases; the mined scientific facts can help preserve our natural resources uninhibited for as long as Mother Nature allows.

Additionally, managers must *have* and *apply* known scientific information to preserve our natural resources; this is required by the 1998 Thomas Bill.

1.1 Data Mining Terminology

The authors are aware of the problematic use of the phrase “Data Mining” and its more colloquially accepted definition within the information management community. The Computer Desktop Encyclopedia defines *Data Mining: exploring detailed business transactions, implying “digging through tons of data” to uncover patterns and relationships contained within the business activity and history* (Freedman, 1999). Alternatives such as Data Harvesting, Data Cataloging, and “Digitizing the ...” have been discussed as possibilities. The authors chose to use the phrase “Data Mining” only for simplicity’s sake; it has been the term generally used by the majority of the NPS I&M Network Data Managers in conjunction with the process of digitizing the parks into the various I&M tools and databases. Furthermore, the authors feel that this project is more akin to digitizing park information from hardcopy into digital formats. This then not only enhances the ability of Park Resource Managers to access, understand, and manage their parks more effectively, but also gives new and transferring park resource staff the ability to readily grasp on park information more efficiently. NPSpecies, NatureBib, Dataset Catalog, and NR Database Template applications are I&M databases used and populated similarly servicewide

1.2 Importance of Data Documentation

The importance of documenting what has been done is paramount to the long term survival of information. Without taking the time to document the what/where/how/when/who, a significant amount of knowledge that surrounds a set of data will be lost. Figure 1 graphs the loss of information over time with “typically” practiced poor information management. In contrast, Figure 2 shows the retention of data details over time when work is documented; institutional memory is not lost for future park and research staff.

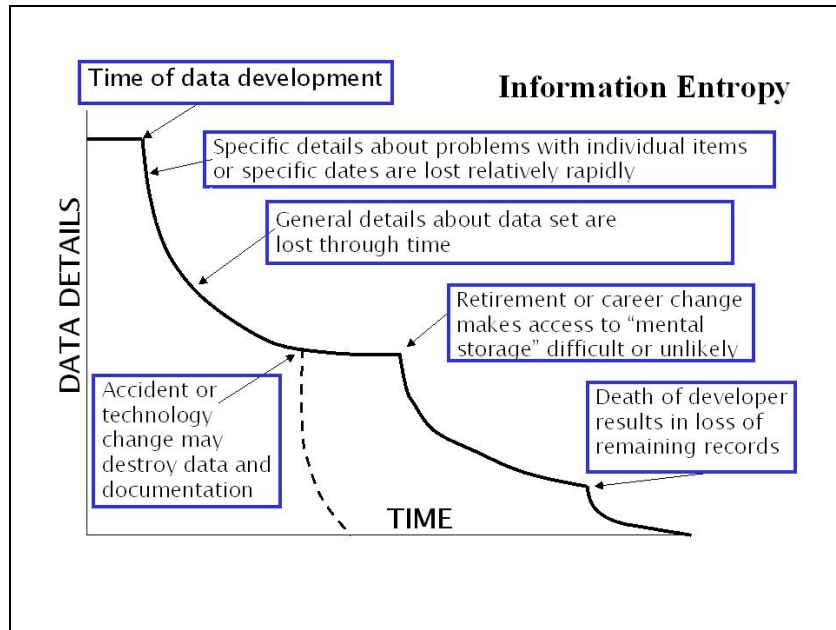


Figure 1. Information Entropy without Metadata.

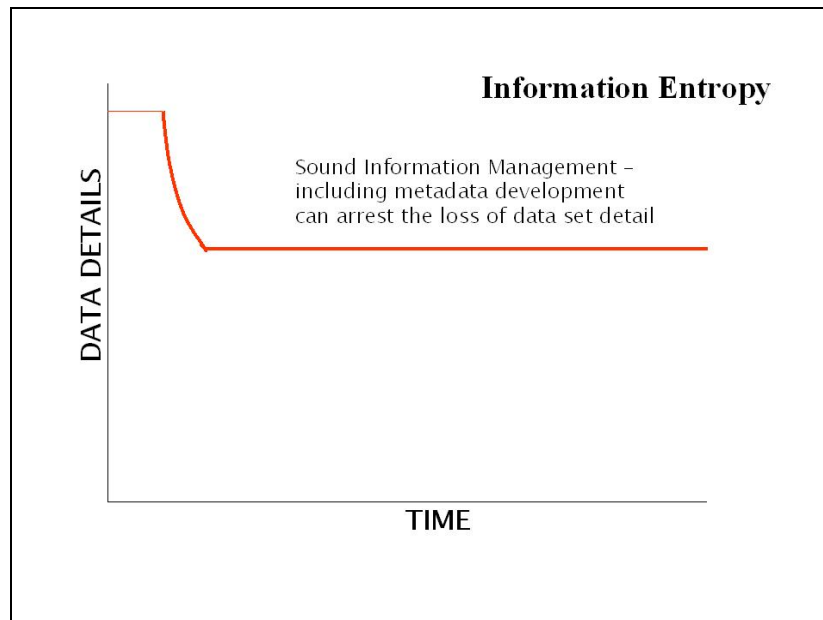


Figure 2. Information Entropy with Metadata.

2.0 Goals of Data Mining

The goal of data mining in the Klamath Network (KLMN) is to promote data stewardship through identification, cataloging, and documentation of existing natural resource information (species and non-species specific) in parks using the standard tools provided by the I&M program.

2.1 What are the natural resources?

In the Natural Resource Inventory and Monitoring guideline (NPS 2003), appendix A identifies a recommended minimal set of natural resource information for a park or network. The minimum set is comprised of 12 distinct categories which are listed below, with an unofficial 13th category.

- 1) Bibliographies (documenting the next two involves creating bibliographies).
- 2) Comprehensive species list—a list of all possible species within a park.
- 3) Information about abundance and distribution—how many species exist and where are they found.
- 4) Vegetation Mapping
- 5) Base Cartography
- 6) Soils
- 7) Geology
- 8) Location of Water Bodies
- 9) Water Quality
- 10) Air Quality
- 11) Air Visibility
- 12) Climate (Weather)
- 13) Sound (an unofficial “13th” inventory)

2.2 Allocation of Duties

The KLMN has developed a three tiered approach to fulfilling the goal of the initial data mining efforts within our parks. This approach is informed by the guidance established by the I&M program in NPS 75 (NPS 2003). The I&M program has identified six taxonomic categories consisting of vertebrates and vascular plants as the priority focus of the comprehensive species list (item 2, section 2.1 above). Combined with this priority effort is inventory item 3; abundance and distribution of those species. The categories below list the data mining priorities in order of percent effort.

- A) First are the six taxa as the primary focus (60% of data mining effort) of the data mining effort, specifically:
 - 1) Amphibians
 - 2) Birds
 - 3) Fish
 - 4) Mammals

- 5) Reptiles
- 6) Vascular Plants
- B) Second are 10 of the 13 basic inventories (25-30% of data mining effort):
- C) Third is a need for general scientific, legislative, and resource management documents to support the network's monitoring program; these documents will also assist with the development of the KLMN Library (10-15% of data mining effort).

KLMN Data Mining plans to accomplish these goals by: 1) Inventorying: finding additional evidence for species (predominately from the six taxa) for the network's parks, 60% of the Data Mining Team's responsibilities; and 2) Monitoring: document information about the network park's natural resources, 40% of their duties.

3.0 KBaM!

Once information has been found, it needs to be documented. Documentation involves where "it" is and what "it" is. "It" refers to information on one of the 13 categories (section 2.1 above). Data mining is discovering where and synthesizing what it is and then documenting it (Catalog, Bibliograph, and/or Metadata: aka KBaM!). Once the where and what have been accomplished, the information (referred to as "data") needs to be documented in such a way that it is readily available for management personnel to use in decision making processes. The three I&M tools KLMN Data Mining will use to document data are NPSpecies (sometimes referred to as NPSPP), Dataset Catalog, and NatureBib; these will be discussed in depth later. An observations database may also be needed and therefore populated. There are three components to KBaM!

K=Catalog is the first step of the data mining process at a park. Cataloging is the process of visiting and then recording the locations of all data types at a park. The idea is to physically make a list of the resource data types and locations within the park. Once a list is compiled, it is prioritize according to the hierarchy above (section 2.2).

B=Bibliograph, the second step in the data mining process. This step involves the I&M databases NPSpecies and NatureBib. Start with the area where the highest priority data (derived from the Catalog list) is located. Examine the area for documents/references not yet in the I&M databases. All documents not in the appropriate I&M databases (NPSpecies and NatureBib) need to be input. When this is done, proceed to the next priority from the catalog list, etc. If digital datasets are discovered, note them for the next step.

and

M=Metadata is the third step in the data mining process. Metadata is "data about data", or the explanation of the data. All digital datasets need to have metadata produced. Various tools are used to make metadata: SMMS, ArcCatalog, Dataset Catalog, NPS Metadata Tools, ITIS, etc. *Note: technically anything produced prior to 1996 does not require metadata to be associated with it; all datasets after this date are mandated by law to have metadata.* Appendix E is a table showing the common or typical metadata tools used to develop metadata based upon data types, and the metadata storehouse.

There is typically some misunderstanding as to what constitutes a bibliography versus a catalog or cataloging and how they differ. *The difference is that a bibliography describes works and editions of works, but not actual physical items. A catalog, by contrast, primarily describes particular, physical items in a particular collection* (<http://csdl.tamu.edu/DL95/papers/levy/levy.html>). In simple terms a park bibliography can contain information about materials that are not directly housed at a park but found in outside collections, libraries, etc.... A park catalog can only contain information about materials housed somewhere within that park.

4.0 Places to Look

- 1) Individual Parks (to be done as the priority)
 - a. Parks Resource Personnel: talk with them concerning other agencies or groups that may have conducted research in their parks. Check out the “Research Permit and Reporting System” website for more information (<http://science.nature.nps.gov/research/ac/ResearchIndex>). This website shows those past research applications submitted online. Although these all have a BibId# associated with them, the BibId# does not correspond to NatureBib. Also, ask for Investigators Annual Reports (IARs for short [1ci]) from before the online system was started.
 - b. Park Libraries
 - c. Natural Resource Files.
 - i. IARs
- 2) Agencies (locations, types of holdings, who works on what)
 - a. Federal: e.g., USDA Forest Service, BLM, USGS
 - b. State: e.g., Department of Natural Resources
 - c. County, water quality, soils, etc.
- 3) Universities and Colleges on the West Coast
 - a. Libraries
 - b. Species collections
- 4) Private Collections
- 5) Private consulting firms (Non-government organizations [NGOs])
- 6) Collections Database—See collections database notes.

**2-4 may be most important for the smaller parks (e.g., ORCA and LABE.).

5.0 What to Look for: Types of Data

In general, there are two types of natural resource data: species specific and non-species specific. Species specific data is the easiest to define: the data describes or discusses species and issues pertaining to species; the document mentions species by name. Non-species specific data simply

does not mention species by name. Geology, air quality, or water quality data are examples of non-species specific if the data lacks species names.

1. References—written document (species or non-species specific)
 - A. Books
 - B. Popular Journals
 - C. Technical Reports
 - i. Government
 - ii. Public
 - iii. Private
 - D. Peer-Reviewed Journals
 - E. Theses/Dissertation
 - F. Research Permits
 - G. Field Notes
 - H. Management Plans
 - I. Letters
2. Vouchers: there are three types (species specific)
 - A. Specimen-- e.g., a captured Vagrant Shrew, *Sorex vagrans*, frozen at OSU. Specimens can be collected for all six taxa.
 - B. Images-- such as a photograph or digital image that was taken of a species. This works well for some taxonomic groups (birds, amphibians, reptiles, and fish) but not others (small herbivores). Using images as vouchers can be problematic among all taxa. For instance, the image can be blurry or does not expose a character needed for identification.
 - C. Sounds-- a bird or amphibian call was recorded; this works with amphibians, reptiles, birds, and possibly also some mammals.
3. Observations (species specific)
 - A. Dr. Fargo saw a Vagrant Shrew in ORCA, but did not collect a voucher specimen. However, he did fill out an observation card. This is the least reliable however still goes into the observations database. At a later date, within the data mining season, the KLMN Data Manager will transfer the observation data to NPSpecies. In many cases, a reference “could” be considered an observation since typically a reference contains information based upon a “sighting” by an individual and does not have a related image or voucher of the species, however the sighting(s) are typically made by subject area experts.
4. Maps (species or non-species specific)
 - A. Physical
 - B. Themes
 - C. Coverages
 - D. Shape Files
 - E. Layers
5. Photographs/Images (species or non-species specific)
 - A. Aerial photographs/images
 - B. Photographs/images of natural resources
6. Databases (species or non-species specific)
7. Tables/datasets (species or non-species specific)

6.0 Data is Found: Now What?

If the data is natural resource related, park specific, and deemed useful, it needs to be entered into an NPS database and possibly photocopied. The KLMN will be using three NPS databases and an observations database. See the recommended reading section for expanded explanations on the below items.

6.1 I&M Tools

6.1.1 *NPSpecies (NPSP)*

NPSpecies is the database “house” to which Dataset Catalog and NatureBib are linked; it is also a master list of all park species. Within *NPSpecies*, three evidence types can be populated: 1) vouchers—actual specimens collected; 2) observations—species that people have observed and then filed an observation report on with the park (note: observations will not be directly entered into *NPSpecies* by the DMT; see observations database below); and 3) references—written documents about the species.

There are two ways to access *NPSpecies*: the desktop and the online version. The desktop version can be downloaded from the I&M Applications and Databases webpage (<http://science.nature.nps.gov/im/apps/index.cfm>). All of the computers at the KLMN Office can access the desktop version of *NPSpecies* through the *NPSpecies* folder on the network drive, file *NPSpeciesXP.mdb*. The online version is accessed through the same webpage however a username and password are required to access restricted login website; these may be obtained via the Klamath I&M Data Manager.

An online training Power Point presentation with instructions for downloading is available at the Klamath Networks Data Management webpage (http://www1.nature.nps.gov/im/units/klmn/DM_Main_Page.cfm). *NPSpecies* Power Point training presentations are also available for the desktop version at the KLMN Data Management webpage. Viewing these training presentations is strongly recommended prior to attempting to populate *NPSpecies*.

6.1.2 *Dataset Catalog*

Dataset Catalog is a tool for keeping an inventory of data and providing abbreviated metadata, “metadata lite,” about a variety of natural resource datasets: physical files, photographs, digital scientific data, and spatial data. The one-page input and report forms provide a straightforward way to document all types of resource data that may or may not have met formal metadata standards. As with other NPS applications, the master version of the *Dataset Catalog* will be available through a website and will be linked to *NPSpecies* and NatureBib. *Dataset Catalog* has been downloaded from the I&M Applications and Databases webpage and is available from all KLMN computers to the network drive: G:\DATACAT\FY04\Dcat2K3XP.mdb.

6.1.3 NatureBib

NatureBib is the master database for natural resource bibliographic references that merges a number of previously separate databases (e.g., NRBib, GRBib, DeerBib, etc.). It will be possible to download data from the master web-based version into an MS Access version that can be used locally on computers without an internet connection; as this is not yet a reality, all searches need to be done online. The online version of NatureBib is linked to other databases such as NPSpecies and the NPS Online Permitting system. NatureBib is the hub of the NPS databases; the other databases reference NatureBib's "Bibkey ID numbers" as a way to identify records. (Bibkey ID numbers are NatureBib's unique identifier for each record. The KLMN uses the term "NatureBib#" synonymously with "Bibkey ID").

As with the online version of NPSpecies, NatureBib's Restricted Login website (<https://science1.nature.nps.gov/naturebib/nb/simple/clean>) requires a password for access (typically the same login works with both NPSpecies and NatureBib online versions). The NatureBib desktop version is available for download. However, NatureBib has been downloaded and is available on the Klamath network drive G:\NatureBib\FY04\NatureBib.mdb. The desktop version is for entering references only. If possible, all references should be entered online; this allows the user to immediate obtainment of a NatureBib#. In the event of problems with the internet connection (either at the park or where NatureBib is housed), references need to be entered into the desktop version. Documentation is paramount in this case since a NatureBib# will not be obtained for several weeks. The NatureBib# will be used to finish populating the References portion of NPSpecies once it is obtained.

There are a number of training materials available for NatureBib. A training presentation for the desktop version is available for NatureBib at: [Nature & Science: NatureBib website](http://www.nature.nps.gov/nrbib/index.cfm) (<http://www.nature.nps.gov/nrbib/index.cfm>, under the highlights). This gives valuable information on how to use the desktop version. A training presentation on where to look for pertinent information within books, journals, formal reports, maps, and other places can be found at the [NatureBib Reference Help Site](http://www.nature.nps.gov/nrbib/tutorial/HOME.html) (<http://www.nature.nps.gov/nrbib/tutorial/HOME.html>). There is a NatureBib tutorial for the online version available on KLMN computers at: G:\NatureBib\FY04\TrainingMaterials\NatureBib_online_training. Figure 3 below can aid in determining if a particular document is documented in NatureBib or elsewhere.

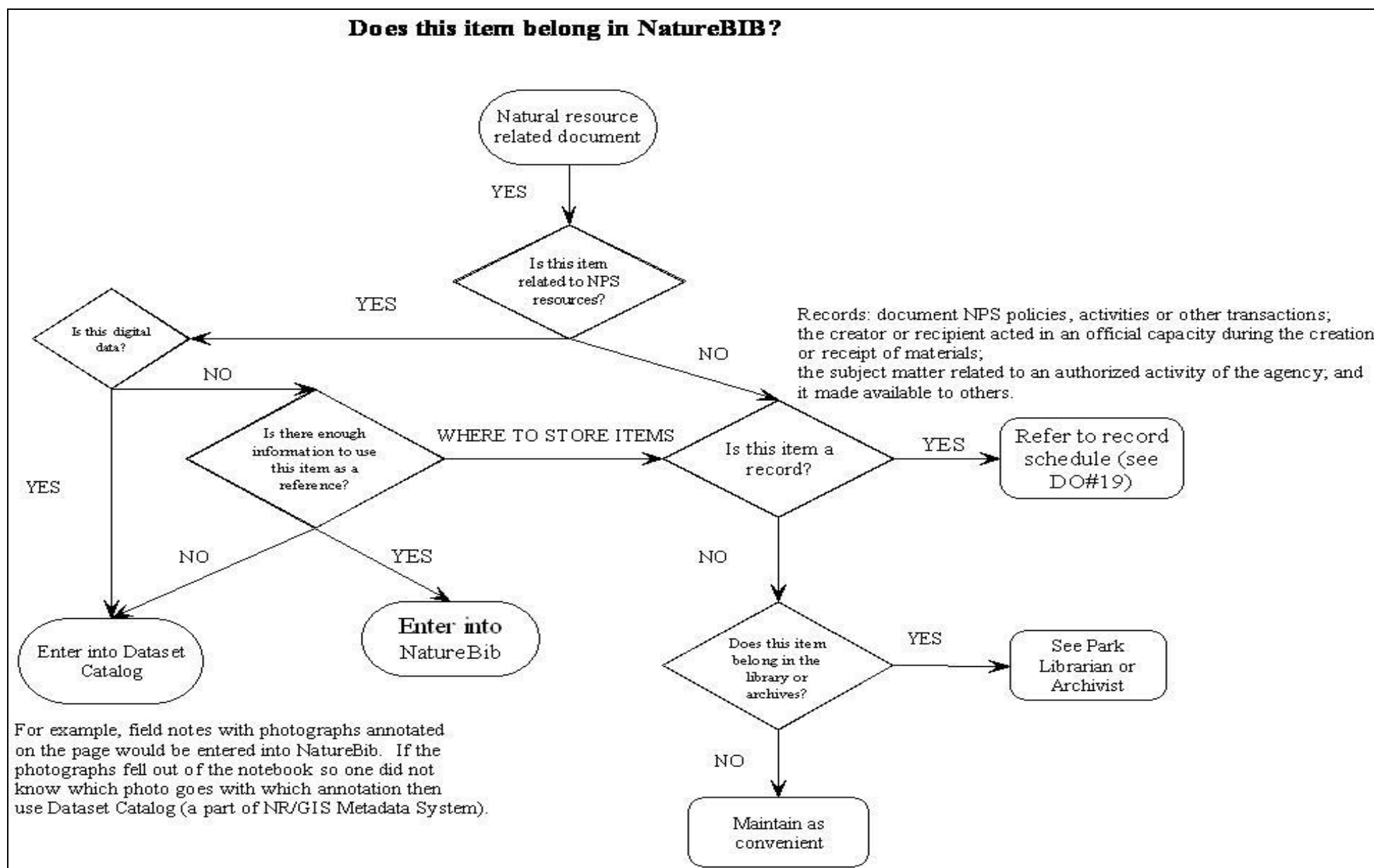


Figure 3. Resource Document and Records Decision Tree

6.1.3.1 Where in NatureBib Does It Go?

Table 1. NatureBib Reference Input Form Type and Description

NatureBib Form	Description of Form
Book	An entire book
Book Chapter	A single chapter of a book; multiple chapters require separate forms
Published Report	A published document, possibly part of a series, and may have an associated volume. Look for publisher's information.
Unpublished Report	An unpublished document, informal reports, field notes
Thesis/Dissertation	A thesis or dissertation, not part of a series
Data Set	Do NOT put in NatureBib!! Instead, put in DataSet Catalog (All digital data, collections of photos, unpublished videos, GIS layers/digital maps)
Journal Article	A published article in a journal; entire journals can be referenced.
Map	A printed map
Conference Proceedings	Conference notes, summaries, etc.; possibly part of a series
Correspondence	A written letter, email, or memorandum. Letters do not have a title.
Other	Brochures, published videos (like a PBS documentary), audio recordings, newspaper articles

It states in the NatureBib tutorial CD that “documents with associated digital data need to have both entities documented.” The document goes into its appropriate NatureBib form and the digital data goes into the NatureBib Dataset form. The two are linked through the NatureBib#, which goes into the Larger Work Citation field within the Data Set form (the KLMN will instead document datasets into DataSet Catalog).

Digital data or electronic information is some times confusing. According to OCLC (Online Computer Library Center) and the MRAC (Machine-Readable Cataloging) Standards Office of the Library of Congress:

"Material (data and/or program(s)) encoded for manipulation by a computerized device. This material may require the use of a peripheral directly connected to a computerized device (e.g., CD-ROM drive) or a connection to a computer network (e.g., the Internet)."
*This definition does **not** include electronic resources that do not **require** the use of a computer, for example, music compact discs and videodiscs.*

(<http://www.oclc.org/support/documentation/worldcat/cataloging/electronicresources/default.htm>)

6.2 Other Databases

6.2.1 Observations Database

Instead of entering observations into NPSpecies, the KLMN Data Manager has created an observations database using park observation cards as a reference for each park where an observational database does not already exist. All observations will be entered into this database. In order to create this observations database, several questions (listed below) were posed to the parks regarding their needs for an observations database.

- 1) Can we please obtain a blank copy of an observation card from your park (preferably in digital format)?
- 2) Does your park have an observations database? We already have Observational Databases for Lassen Volcanic and Lava Beds. However, these are not necessarily designed from the observation card standpoint.
- 3) When the KLMN develops the Observations Database based on the observation cards we get from you, would you have any desire to use it to record future observations? (We are asking since this impinges upon how we build the database; for Data Miners' use only, a different structure is created than the more user-friendly version for each of the parks to use at the visitor center or other location.)

Replies to these questions will be added into a separate file (G:\DataMining\KLMN\Documents\Observations_database_Qs\filed by park code) as they arrive.

7.0 Data Entry Error Checking (QA/QC)

All data entered will be verified twice and validated twice. This is just good sound data management!

7.1 Versioning

Versioning will be used to keep track of data file changes (e.g., updates, additions, edits, verification, or validation). At the time data are entered or when information is digitized (converted to digital form for use on a computer from some type of hard copy), it is done so in a file (spreadsheet, word processor, etc.) with a unique but appropriate file name including the date. After the data are verified, the file should be saved with an appropriate file name, current date, and versioning number. The procedure is repeated every time (i.e., a new versioning number is applied) the file is changed. However, the file name and date do not need to be changed since the file name reflects the type of information contained and the date reflects the date that the file was created. Windows Explorer will keep track of the most recent date that the file was modified. For example, "ParkVouchers_122903.doc" would be changed to "ParkVouchers_122903_v2.doc." Note on versioning: change a version number if tables, attributes, fields, etc. change. If only data within these is changed, then only add a new alpha character to the version number (e.g., ParkVouchers_122903_v2b.doc). Then, the file name shows that this file is a Word document about park vouchers, created on December 29, 2003, and is in version 2b. The procedure for changing a version is that when an existing file is first opened to work in it, immediately resave the file with the "Save As" and give it the new version file name. When that period of work is completed and the file is correct, then purge (delete) the older backup versions.

Note to DMT as they are proceeding with a file. Until such time as the final completed version is obtained, please keep the two most recent back versions as you create a new version to work on, therefore deleting only the oldest. This then should leave 3 versions of file, the two most

recent back versions and the newest version being used. Be sure to backup your working version often, either through automatic backup within the software application if available or physically.

7.2 Verification

Verification is the process of checking data entered into a computer application or software against the hard copy the data is transposed from for errors. For example, *Calystega* was entered in a database but *Calystegia* was written in the thesis. This is an honest mistake and needs to be corrected. Catching this mistake is verification. Verification will happen everyday as databases are populated (self-verification) and preferably also at the end of the day or after changing data entry personnel. Pete will verify Rose's entries; Rose will verify Pete's entries.

7.3 Validation

Validation is checking data entered into databases to make sure that it is within the realm of possibility. For example, Rose populated NPSpecies using a journal article claiming a White Sturgeon, *Acipenser transmontanus*, was found in Crystal Creek, Whiskeytown NRA. Not knowing about White Sturgeon or Crystal Creek, Rose proceeds unaware that Crystal Creek isn't large enough to hold a White Sturgeon. Rose was correct in populating the database with the information as she read it. Brandy is validating the data and recognizes the strange entry, bringing it to Rose's attention. Rose entered the data as she read it, but the article was askew, for whatever reason. Validation caught the error. Validation will be done by crews as they verify and officially by the Network Data Manager in conjunction with park staff before he submits the data. Note that this may have to be modified to include someone that is more knowledgeable about the data.

8.0 The KLMN Library

The KLMN Library will be initiated from the data mining efforts. The Library is intended to provide network staff with quick access to relevant scientific, natural resource, policy, and historical documents that will inform the Vital Signs Monitoring Reports, future inventory, monitoring, and research. To this end, paper and digital copies of documents addressing subjects relevant to general monitoring and to ongoing inventory, monitoring, and research in the KLMN are needed. The physical library will be composed primarily of hard copy documents but digital documents will also be accepted, as applies, for a companion digital library.

Topical areas of special interest include:

- 1) Air and water quality
- 2) Climate
- 3) Conservation planning
- 4) Environmental monitoring
- 5) Environmental statistics
- 6) Fire ecology and management
- 7) Global change

- 8) Habitat fragmentation
- 9) Human impacts to parks
- 10) Impact assessment
- 11) Natural disturbance regimes (fire, floods, herbivory)
- 12) Non-native species (plants, animals, pathogens)
- 13) Park resource management
- 14) Rare or sensitive ecosystems (alpine areas, wetlands, lakes and streams, coastal zones)
- 15) Rare, sensitive, and special status species
- 16) Regional ecological information
- 17) Regional, ecological, or scientific information
- 18) Resource management
- 19) Transboundary issues (effects of adjacent land use)

The DMT are encouraged to contact the KLMN Network Coordinator for advice on proper collection of documents for the Library.

The Network Coordinator will also search NatureBib online to find specific documents he would like collected from individual parks. A list will be provided to the data mining crew prior to visiting each park.

9.0 Required Reading Materials

- I) The Klamath Network's Black Book (Government Directives and Orders)
 - a. NPS-75 (I&M Guidelines)
 - b. FOIA (Freedom of Information Act)
 - c. GPRA (Government Performance Results Act)
 - d. NRC (Natural Resource Challenge)
 - e. DO 24 (NPS Museum Collections Management)
- II) NPSpecies Notebook (read all the purple tabbed articles)
 - a. NPSpecies Login/Password Requests
 - b. The NPSpecies Data Management System
 - c. NPSpecies User Guide, Getting Started (pages 6 and 7 only)
 - d. NPSpecies Explained PowerPoint Presentation
 - e. Sensitive Data in NPSpecies
 - f. NPSpecies Data Dictionary for Users
- III) NatureBib Notebook
 - a. Does this belong in NatureBib
 - b. A Quality Reference
 - c. Natural Bibliography Tutorial
 - d. NatureBib Help Files
- IV) Dataset Catalog Notebook
 - a. Dataset Catalog front page
 - b. Dataset Catalog Upgrade – Version 2003.1

10.0 Questions for the Parks/Agencies

1) Can we have a list of the past research permits from before the online version of RPRS was created? 2) Do you have a list of Investigators Annual Reports (IARs)? 3) Who is the best contact person? 4) Do we have a space we can work with both telephone and internet access? 5) Is there housing in park? 6) What do you want to gain from the data mining effort? 7) Do you have any suggestions that might help the data mining effort?

11.0 Collections Databases

A collection is considered similar things group together as a whole, it may be a collection of references, vouchers, or data. Collections in this case is referring to a group of specimens (study skins, skulls, bones, plant mounts and/or other preserved biological material) housed in a repository (such as a museum or herbarium). Many museums and herbaria within the past 15 years have been digitizing their collections and are therefore available to search through the internet or by request directly.

11.1 KLMN Collections Database Notes

The following information on the collections database was compiled by a graduate student.

I completed a 2-credit internship with the Klamath Network Inventory & Monitoring Program (KLMN) in Ashland, Oregon. The KLMN recently received funding for a large-scale data mining effort. Part of this effort entails finding out what institutions house collections that may include species (of the six taxonomic categories: amphibians, birds, fish, mammals, reptiles, and vascular plants) found in the Klamath region National Parks. A database was created to organize the collections information so that the Data Mining Team (DMT) and others could utilize it. The goals of this internship were to learn *Microsoft Access* and help complete the collections database, to perform research and outreach on locating collections, and to populate the database with new collection information.

The first half of my internship was spent creating and amending the database. I began with an incomplete *Access* database and constructed tables, queries, relationships, forms, and reports. The Data Manager supervising this project, took over the final form creation; I moved on to edit the existing collections information as well as find new collections contacts. I did this through web searching, email, and phone calls. I put out two mass emails, one to museums and universities and the other to National Park Service contacts regarding voucher, observation, or collections information they might have. I then incorporated their responses into the database, created new documents, or entered their information into an Excel spreadsheet that had been created specifically for NPS information.

This experience deepened my understanding of how complex and disparate the network of existing information is on park taxa. It is a challenge to bring it all together in an accurate and updated manner. It was good for me to be part of building the framework for storing this information; I have usually just been on the inputting end. As a result, I am able to see the value

in databases for this type of effort. The project is far from completion; I only participated in a fraction of it. The database is well on its way to being a useful tool for the Data Miners. They will be able to go into the database and query for a particular park or taxa depending on what type of information they want. Many institutions have digitized their collections and datasets can be downloaded. The KLMN has a few of these and I gathered many more sources for datasets. One can search these datasets by geographic location to see if any of their specimens came from the Klamath region Parks.

There is educational value in this effort as researchers, park staff, and hopefully the public will eventually be able to access one consolidated database, such as NatureBib, and find out about the taxa found in various parks.

11.2 University of Kansas Database Project

In a telephone conversation with Jens Vindum of the California Academy on October 21, 2003, he spoke of a similar data mining project funded by an National Science Foundation grant where all data on fish, amphibians, and reptiles will be consolidated, latitude and longitude added, and available through University of Kansas website (“Species Analyst” link?) with an option to create maps on-the-fly. For more information, contact Linda Trueb (Principle Investigator) or Dave Wake, both at University of Kansas. The same thing is happening for mammals, called “Manis” (check out the University of California Berkeley website or [MaNIS Home](#) (Wieczorek, 2005)).

11.3 How to Request Datasets from Smithsonian

Revised January 2002

ELECTRONIC DATA POLICY DIVISION OF BIRDS, NMNH SMITHSONIAN INSTITUTION

About 375,000 avian specimens (62% of the total) have been computerized in the NMNH collections. Our website lists species computerized thus far by country of origin, sex, and preparation type (skin, fluid, or skeleton). These data serve as a guide to the USNM holdings. Other information associated with the physical specimen (e.g., GIS coordinates, collecting locality, collector, date of collection, body mass, and soft part colors) are placed in sensitive proprietary data fields. Access to sensitive data fields are covered by the same policies that govern the use of specimens. Selective data searches (generally by taxon) are made available to qualified researchers on a case-by-case basis for specific research investigations. We do not provide downloads of sensitive data sorted by geopolitical regions or countries (e.g., Congo). Complete data (all fields) for the entire Type collection (ca. 4,000) are available on our website. While great efforts have been made to ensure accuracy in computerized data, transcriptional errors and misidentifications are occasionally discovered during retrospective reviews of specimen records. Therefore, the computerized catalog must be regarded strictly as a secondary data source.

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12.1 Additional Useful References

- Dataset Catalog: <http://science.nature.nps.gov/im/apps/datacat>.
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- ITIS (Integrated Taxonomic Information System): <http://www.itis.usda.gov/>.
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Appendix A - FY04 Phase 1 Data Mining Summary

Personnel and Training

Five Data Miners and one team leader were hired by the KLMN Network office to begin the data mining effort. The team leader began in Nov 2003. He was responsible for writing the Data Mining Protocol and developing training materials. Four Data Miners were hired at the end of January 2004 and one was hired mid-late February 2004. The four Data Miners received training on NPSpecies and NatureBib from the crew leader. The four Data Miners and the crew leader received metadata and NatureBib training from WASO personnel. This session covered NatureBib, Dataset Catalog, SMMS, and Arc Catalog. The fifth Data Miner received all training (NPSpecies, NatureBib, Metadata) from the team leader.

One Data Miner resigned in March and a replacement was hired. The replacement Data Miner was trained in NPSpecies and NatureBib by another team member, as the team leader was on leave. The first week in June, the crew received Observation Database training, given by the Network Data Manager. Also during this week, the team leader led a Metadata training session. Two Data Miner positions expired on the third week of September 2004. The other three and the team leader continued data mining until January 2005.

General Procedure

Each park in the Klamath Network was contacted and a Person of Contact (POC) was established. This person served as the primary liaison to the Data Mining Team. The POC assisted with park housing, if available, and setting up park tours. The POC received a copy of the Data Mining Protocol prior to our first visit to the park.

The overall goal, as established by the Network Data Manager, was to “digitize the parks.” This means entering all data about natural resources into the appropriate I&M tool.

The crews began data mining founded upon this goal. It quickly became apparent that to “digitize the parks” would be a much larger task than originally expected. The money budgeted to the FY04 Data Mining Project would not allow such a task to be completed. Thus, the Data Mining Protocol was modified to digitize all species specific documents (from the six taxonomic groups) and completely abandon creating metadata for FY04 stage 1. This meant that a document about macroinvertebrates was not digitized (i.e., not entered into NatureBib or NPSpecies).

Exact procedures varied from park to park depending on the number of data mining personnel, internet access availability, etc. (see Park Final Reports). The first step upon arriving at a park was to find the locations of all data on species within the six taxonomic groups. Once this was accomplished, a map of park buildings was created, showing the locations of relevant files. The next step was to begin digitizing those files. All files were cross-referenced to NatureBib. If a document was not in NatureBib, it was inputted using the online or desktop version (if the internet was not available). Once a NatureBib# was obtained, the number was written on the document and all scientific species listed in the document were entered into NPSpecies. If a document contained only common names, the document was entered only into NatureBib. Other

protocol specifics are as follow:

- Do Environmental Assessments containing species (EAs).
- Do IARs about vertebrates and vascular plants (all drafts--word from Ft. Collins).
- Do drafts of reports about vertebrates and vascular plants (as with IARs all drafts).
- Do examine the RPRS website and look for IARs done about the parks but that have not yet been found at the parks. Contact PI and ask about report status.
- Do not correct misspelled species names. Enter it "as-is" and make a note that you believe it to be misspelled. It is the procedure to enter correct species names when a qualified expert is available to confirm that a misspelling is incorrect and knows what the corrected spelling is.
- Do not do proposals (Ignore PMIS)!!!
- For lists of common names (such as, Christmas bird counts): if the list of names comes from a source that has standardized common names (birds, fish, and some mammals) or you have expertise in the area to interpret the common names into scientific names, then enter the species into NPSpecies. Check with park personnel to validate the data source. Make a note in the comments section of NPSpecies that the common names were changed to scientific names and cite the source of the conversion data (ITIS, AOU website, etc).

The DMT also entered all Water Quality documents into NatureBib and NPSpecies as applicable.

Park Summaries (FY 2004)

Oregon Caves National Monument -- The ORCA Data Mining effort commenced on February 16. It took nine weeks (968 man hours) to digitize all references on the six taxonomic categories and water quality.

Whiskeytown National Recreation Area --The WHIS Data Mining effort commenced on March 8. It took seven weeks (432 man hours) to digitize all references on the six taxonomic categories and water quality.

Lava Beds National Monument -- The LABE Data Mining effort commenced on March 15. It took seven weeks (540 man hours) to digitize all references on the six taxonomic categories and water quality.

Lassen Volcanic National Park -- The LAVO Data Mining effort commenced on April 5. It took fifteen weeks (960 man hours) to digitize all references on the six taxonomic categories and water quality.

Crater Lake National Park -- The CRLA Data Mining effort commenced on April 12. It took fifteen weeks (792 man hours) to digitize all references on the six taxonomic categories and water quality.

Redwood National and State Parks -- The REDW Data Mining effort commenced on April 19. The Data Mining Team has been at REDW approximately twenty two weeks (1496 man hours), digitizing references on the six taxonomic categories and water quality.

Appendix B – Account Requests

Request for Lotus Notes Accounts

The document necessary for requesting a new lotus notes account is typically managed on a park-by-park bases, as each park may have it's own lotus notes account request form.

NPSpecies/NatureBib Login/Password Requests

For an NPSpecies Login/Password, contact:
KLMN Data Manager
1250 Siskiyou Blvd.
Ashland, OR 97520-5011
541-552-8576

Appendix C – Data Mining Procedures

Criteria for Entering Species into NPSpecies

- The species must have a scientific name.
- Common names alone cannot be used. If you are knowledgeable about a taxon and can attach the associated scientific name you may do so, but only after verifying the data source with park personnel.

Data Mining Order of Operations

Ideal scenario:

1. Find a document/reference not yet in NatureBib.
2. Enter the document/reference into the online version of NatureBib, obtain a NatureBib#.
3. Link species from the document/reference in NPSpecies desktop. When entering the NatureBib# into NPSpecies, use this format: NatureBib# 980765 (for example).
4. If applicable, make metadata.

Worst case scenario:

1. Find a document/reference not yet in NatureBib.
2. When entering the document/reference into NatureBib, the online version is not available. Enter the reference into the desktop version. The document/reference will be assigned a temporary NatureBib#. Use this number as the NatureBib# when entering data into NPSpecies.
3. Link species from the document/reference in NPSpecies desktop. When entering the NatureBib# into NPSpecies, use this format: NatureBib# 980765 (for example).
4. If applicable, make metadata.

Preparing to Enter References/Documents into NatureBib Desktop

1. Make a copy of the NRBib_data_Blank
2. Rename the file NRBib, followed by the four letter park code and last date. An example of a Crater Lake file is NRBib_CRLA_080403.
3. Versioning will be added as needed.
4. To link the files, select *Tools* and then *Browse*. Find the file you just created and select it. Then click *Link Files*.

Preparing a Blank NPSpecies Park-Species List for Data Entry

1. Open the Working Data File of the park for which you are entering records.
2. On the Park-Species List Page, click *Export*.
3. When an Export Wizard dialog box appears, click *Next*.
4. In the same dialog box, select the location to which you want to export data. This location will always be a copy of the NPSpecies_data.mbd file.
5. Uncheck the Voucher, Reference, and Observation boxes and then click *Next*.
6. Click *Next* again.
7. Click *Finish*.

8. After the Exported Records dialog box appears saying Export Successful, click *OK*.
9. Rename the file to which you exported data, including the four letter acronym of the park you exported data from followed by the date. If you exported from a Crater Lake park file, it should look like this: NPSpecies_CRLA_080303. Versioning information will be added as required (see versioning section).

Appendix D – Data Mining Procedures Amended

The protocols were amended on July 11, 2005 in the following ways:

- Enter only reports, published articles, and conference proceedings.
- When in offices, do not update holdings if the document also has holdings in a general access area (e.g., “open area” or archive).
- Enter Unit A of Archives, which is a compilation of park reports. There may be reports intermixed in the other containers of the Archives, but the information primarily consists of datasets, administrivia, and other parks’ holdings.
- When a draft/revision is found, for which a final report has already been entered in NatureBib, only add the draft/revision location to the holdings; do not make a new NatureBib entry for the draft.
- Continue to enter only proposals that are signed.
- Document fragments should not be entered.
- On account of the fact that the central file contains the following types of documents in an easily accessible format, do not enter Federal Register articles, mission statements, memorandums of understanding, project statement sheets, interagency/cooperative agreements, letters, task agreements, contracts, permits, or park project clearances.
- Informal and formal consultations should not be entered.
- Informal notes from meetings and scoping/brainstorming sessions should not be entered.
- Journal subscription series should not be entered.
- Enter park-specific periodicals, newsletters, etc. found in one folder as one holding.

Appendix E – Common Metadata development tools and storehouse based upon data type¹

Table 2. Common File Types and Metadata Input/Output Formats.

Formats	Input_Format_Types	Metadata_Standard	Metadata_Output_Format_Types	Developer_Tool	Preservation_StoreHouse
Data					
<i>Tabular data</i>					
Flat File	dbf, qpro, xls	FGDC Data Profile	HTML, SGML, TXT, XML	NPS Metadata Editor, Dataset catalog, Intergraph Geomedia (SMMS)	NR-GIS Data Store, Biodiversity Data Store
Relational Database	foxpro, mdb, VB	FGDC Data Profile	HTML, SGML, TXT, XML	NPS Metadata Editor, Dataset catalog, Intergraph Geomedia (SMMS)	NR-GIS Data Store, Biodiversity Data Store
<i>Spatial data</i>					
GIS Data File	apr, cov, e00, mdb, mxd, shp	FGDC Data Profile	HTML, SGML, TXT, XML	NPS Metadata Editor, ArcCatalog, Intergraph Geomedia (SMMS)	NR-GIS Data Store, Biodiversity Data Store
GPS Data File	cor, ssf				
<i>Photographs</i>					
Data Photograph	35mm slides, negatives, prints	NPS Digital Photo Meta. Std.		NatureBib, ANCS+	NPS Focus or local server
Historical Photograph	negatives, prints			NatureBib, ANCS+	NPS Focus or local server
Aerial Photograph	negatives, prints			NatureBib, ANCS+	NPS Focus or local server
General Interest Photograph	35mm slides, negatives, prints			NatureBib, ANCS+	NPS Focus or local server

<i>Digital Images</i>					
Data Photographs	bmp, gif, jpg/jpeg, png, tif/tiff	NPS Digital Photo Meta. Std.	HTML, SGML, TXT, XML	Extensis Portfolio	NPS Focus or local server
Remotely Sensed Images	adf, bil, bip, img, nit, png, tif/tiff (DAT, NIT)	FGDC Data Profile	HTML, SGML, TXT, XML	ArcCatalog, SMMS	NR-GIS Data Store, Biodiversity Data Store
General interest photos	bmp, gif, png, jpg/jpeg, tif/tiff	NPS Digital Photo Meta. Std.	HTML, SGML, TXT, XML	Extensis Portfolio	NPS Focus or local server
<i>Quality Assurance</i>					
QA data	dbf, mdb, xls	FGDC Data Profile	HTML, SGML, TXT, XML	SMMS, Dataset catalog	NR-GIS Data Store
QA data sheets	doc, pdf	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
<i>Other Data</i>					
Field notes	doc, pdf	Dublin Core	HTML, TXT	NPS Focus Website, NatureBib	NPS Focus, eTIC
Field data sheets	doc, pdf, xls	Dublin Core	HTML, TXT	NPS Focus Website, NatureBib	NPS Focus
Protocols					
Data collection protocols	doc, pdf	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Data processing protocols/Models	doc, pdf	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Data analysis protocols	doc, pdf, sas	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Protocol changes	doc, pdf	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Reports					
Quarterly and Annual reports	doc, pdf	Dublin Core	HTML, TXT	NatureBib	NatureBib, Procite, eTIC
Final Report	doc, pdf	Dublin Core	HTML, TXT	NatureBib	NatureBib, Procite, eTIC
Field/Trip reports	doc, pdf	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Other published reports	doc, pdf	Dublin Core	HTML, TXT	NatureBib	NatureBib, Procite, eTIC
Presentations	doc, ppt	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Graphics					
Maps	bmp, gif, jpg/jpeg, mxd, pdg, png, tif/tiff	FGDC Data Profile	HTML, SGML, TXT, XML	ArcCatalog, SMMS	NR-GIS Data Store

Drawings/Models/ PowerPoints	pdf, pps, ppt	Dublin Core	HTML, TXT	NPS Focus Website	NPS Focus
Other Information Gathered					
Other information	multiple	Dublin Core	HTML, TXT	NPS Focus Website	NR-GIS Data Store
External Data Used	dbf, mdb, xls	FGDC Data Profile	HTML, SGML, TXT, XML	SMMS, Dataset catalog	
Administration					
Agreements/Contracts	doc, pdf	Dublin Core	HTML, TXT	NatureBib	NPS Focus, local server, eTIC
Study Plan or Work Plan	doc, pdf	Dublin Core	HTML, TXT	NatureBib	NPS Focus, local server, eTIC
Quality Assurance activities/QA Plan	doc, pdf	Dublin Core	HTML, TXT	NatureBib	NPS Focus, local server, eTIC

¹This table is the combined efforts of the LAME/MOJN Data Management Group.

The U.S. Department of the Interior (DOI) is the nation's principal conservation agency, charged with the mission "*to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian tribes and our commitments to island communities.*" More specifically, Interior protects America's treasures for future generations, provides access to our nation's natural and cultural heritage, offers recreation opportunities, honors its trust responsibilities to American Indians and Alaska Natives and its responsibilities to island communities, conducts scientific research, provides wise stewardship of energy and mineral resources, fosters sound use of land and water resources, and conserves and protects fish and wildlife. The work that we do affects the lives of millions of people; from the family taking a vacation in one of our national parks to the children studying in one of our Indian schools.

NPS D-XXX, June 2005

National Park Service
U.S. Department of the Interior



Pacific West Regional Office
Natural Resource Stewardship and Science
1111 Jackson Street
Oakland, California 94607

www.nps.gov

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